

AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph on beginning on page 18, line 4, with the following amended paragraph:

--In known manner, the head comprises a generator 116 to generate ink drops. Drop generator 166, from electrically conductive ink contained under pressure in a generator chamber 116, forms two ink jets. Each ink jet is fractionated into a succession of drops, for example by means of one or two vibrators housed in the chamber. The drops are electrically charged in a selective fashion by electrodes 120, 120' through which each jet passes and which are supplied by a voltage generator not shown. The charged drops of each jet pass through a space lying between two deflection electrodes 2, 3; 2',3'. Depending upon their charge, they are deflected to greater or lesser extent. The drops that are not or are least deflected are directed towards an ink recovery gutter 6 while the other deflected drops are directed towards a substrate 27 carried locally by a support 13. The successive drops of a burst reaching substrate 27 can therefore be deflected towards an extreme low position, an extreme high position and successive intermediate positions. The set of drops from the burst forms a swathe of width $[\Delta X]$ perpendicular to a relative forward direction Y of the print head and substrate. The print head is formed by means 116 to generate and break up ink jets into drops, charge electrodes

120,120', deflection electrodes 2,3;2',3' and gutter 6. This head is generally enclosed in a casing not shown. The time lapse between the impact of the first and last drop of a burst on the substrate is very short. This means that despite continuous movement between the print head and the substrate, it can be considered that the substrate has not moved relative to the print head during the printing time of a burst. The bursts are fired at regular spatial intervals. The combination of relative head and substrate movement and of the selection of drops from each burst which are directed towards the substrate enables the printing of any pattern.--

Please replace the paragraph on beginning on page 19, line 14, with the following amended paragraph:

--According to an important characteristic of the invention, the axes of the two nozzles 31, 32 converge at a point A. The converging axes of nozzles 31, 32 define a plane. This plane contains the swathe of width $[\Delta X]$ perpendicular to the relative forward direction Y of the print head and of the substrate. In the advantageous embodiment shown in figure 1, deflection electrodes 2 and 2' are physically formed in a single electrode 2, called a central electrode. This central electrode is located between the so-called end electrodes 3 and 3'. The axes of nozzles 31, 32, the charge electrodes 120 120' and deflection electrodes 2,3,3' are arranged symmetrically relative to a

plane perpendicular to the plane of the nozzle axes and contain a bisector of the angle formed by the axes of nozzles 31,32. This plane will hereinafter be called plane of symmetry. Gutter 6 to recover ink drops not used for printing is common to the drops derived from nozzles 31 and 32. The ink drops not used for printing reach a single orifice 61 of this common gutter 6. The ink drops not used for printing can, according to the embodiments of the invention, be either non-deflected drops in which case the centre of common orifice 61 coincides with convergence point A of the axes of nozzles 31, 32, or drops that are scarcely deflected in which case convergence point A of the axes of nozzles 31,32 is located upstream of said orifice 61. In the example shown in figures 1 and 2, non-printable drops are non-deflected drops, and the convergence point of the axes of nozzles 31,32 substantially coincides with the centre of orifice 61 through which non-printable drops enter recovery gutter 6. In the example shown in figure 1, the drop generator 116 is a single chamber generator for both jets. A nozzle plate 117 closing the single chamber has symmetry relative to the plane of symmetry and forms a dihedron having the plane of symmetry as bisecting plane and whose angle is the supplement (180° complement) of the angle formed by the axes of nozzles 31,32. The nozzle axes are respectively perpendicular to each of the faces of this dihedron. This embodiment in which the junction drops

derived from each of the jets are the non-deflected or least deflected drops is advantageous since the converging point of the pathways of the drops derived from the two nozzles, which is either converging point A of the axes of nozzles 31,32, or a point slightly downstream is independent or practically independent of voltage of the charge electrodes or of other parameters determining the charge and deflection of the drops. In addition, in this configuration gutter 6 may be placed closer to a downstream part and even, as will be seen below, upstream of the part that is most downstream from deflection electrodes 2,3,3'. In this manner the space requirement of head 30 is reduced. In figure 1, dotted lines show a few remarkable pathways of drops derived from nozzles 31,32. First pathways 9,9' respectively derived from nozzles 31,32 are the pathways of non-deflected drops. Having regard to high drop velocity, these pathways substantially coincide with the axes of nozzles 31,32 respectively. As explained above, these pathways converge at a point A which substantially coincides with the centre of orifice 61 of single gutter 6. Symmetrical pathways 5, 5' are also shown of the least deflected drops derived from nozzles 31,32 respectively. Pathways 5,5' converge at points B, B' respectively with substrate 27. Points B and B' have the same distance between them as the distance between two spatially consecutive drops from a burst. As explained above, since points B,B' are located at convergence points

between substrate 27 and pathways of the least deflected printable drops, the relative positions of these points are little sensitive to variations in drop volume. On this account, the juncture between swathes traced by the drops derived from nozzles 31,32 respectively, is always of the same quality without the need to change the overall configuration of head 30. Two pathways 8, 8' are also shown of the most deflected drops derived from nozzles 31,32 respectively. The respective points of intersection C,C' of pathways 8,8' with print substrate 27 are symmetrical with one another relative to the plane of symmetry. Therefore swathes BC and B'C' are also symmetrical with one another relative to the plane of symmetry. They are located in the extension of one another. Therefore with the twin-nozzle head of the invention a swathe C'C can be produced that is twice the width of the one which can be produced by a head with a single nozzle, the swathe of double width having the same quality as a swathe of single width having regard to the quality of juncture between the two swathes of single width. It is observed that the plane of the axes of the jets contains all drop pathways. Since these pathways do not lie in different parallel planes, as in the case described in the above-cited patent application WO 91,11327, swathes B'C' and BC may be printed simultaneously. If the total width of double swathes C'C to be printed is less than twice the maximum height BC of the single swathes which can be

produced by a jet derived from a single nozzle, it is then possible at least to double print speed in simple manner. Since points BB' are in the centre of the double swathe of reduced width, the duration of a burst of reduced amplitude is also reduced. Printing speed will be greater the smaller the swathe to be traced. It is to be noted that with the head described in above-cited patent WO 91,11327 for example, an increase in printing speed if the swathe is small is theoretically possible. However with said head if the duration of the burst from a head is reduced, in order to give consideration to a smaller height of each single swathe, the time offset between the firing of each of the bursts from the two nozzles must be reduced accordingly. This assumes the adaptation, not contemplated in this patent application, of the piloting electronic circuits to achieve variable offset in relation to the width of the single swathes.--